Notebook, N-93-05-16

This notebook covers the period May 1893-May 1894. It was probably used by A. Y. Stewart. A few entries are by Joseph W. Harris. Included are notes and calculations regarding ore assays and other chemical analyses, the preparation of chemical solutions, the testing of bricking compounds for ore concentrates, and lubrication experiments. There are also notes relating to urinalyses of Edison and other experimenters, tables of meter zinc weights, and one page of notes regarding the Waring Electric Co.'s "Novak" incandescent lamp. The front cover is labeled "A. Y. S. Chemical Work." The spine is labeled "139." The pages are unnumbered, and several pages have been removed from the book. Approximately 130 pages have been used.

A series of routine chemical analyses and ore assays at the end of the book has not been filmed.

Tuesday May 16th 93

Preparation of Fehling Solution.

[627]

Dissolve 48 gr. of Rochelle Salts in water add 100 ccm of NaOH + aq solution of 1.12 sp.g. and then a solution of 10 gr. $CuSO_4 + 5aq$ in 40 ccm of water and dilute to 288 cc

Standardized with ~~Glucose~~ Cane Sugar

1 cc = 0.05 mm. Glucose

Wednesday May 17th

Wed May 17th 93

Preparation of Carbonsesquisulfide C_2S_3

I. Hydrogen Carbosesquisulphide $C_2S_3H_2$ ppt. came down as a resinous mass.
Agitate CS_2 with Sodiumamalgam partly with a little water.
Preparation of Sodiumamalgam 2½ %.
1 kilog.

~~120 gr. CS_2 with 2.~~

~~Negative result.~~

Thursday May 18th

Urine tested with Fehling solution for glucose
Result: negative

Friday May 19th

Preparation of 1 kilg. Sodium-amalgam 2%

Saturday May 20th

Preparation of Carbon tetra iodide from Aluminium iodide and Carbon tetra chloride.

Monday 22d

Preparation of Aluminium iodide

proportions 197 gr. of Iodine to 115 gr. of Aluminium.

The operation to be carried on in an atmosphere of CO_2 ~~fill a flask~~ In a florence flask weigh the Aluminium and pass CO_2 till all the air is driven off. Then add 1% of the quantity of Iodine to be used, and heat up till reaction begins. Then add the rest of the iodine in very small portions at one time and each time only when the previous reaction has stopped.

[illegible] the reaction has [illegible] sufficiently [illegible] keeps the Aluminum Iodide in a liquid state. When all the Iodine has been added heat to drive off an excess of the same. Then let cool, and after breaking the bottom of the flask sublime rapidly, and dissolve immediately the Aluminum Iodide in three parts of its weight of Carbon bisulphide (CS_2).

To make the [illegible] Iodide it is necessary to operate in an atmosphere of CO_2 and for this purpose use the dry gas over the Aluminum in a big flask.

Cool the flask to 0°C. and add a solution of Carbon-bisulphide saturated in a liquid compound of Carbon bisulphide [illegible] by [illegible]

The reaction takes place of itself.

Separate the liquid from the Aluminum chloride formed by decantation.

Wash with water and distill the carbon bisulphide off (Atmosphere of CO_2)

The Carbon tetra Iodide is a darkish red crystalline body very much like Iodine.

Wash with water then with Sodium bisulphite and

The body weight to be dried in a Vacuum dessicator over sulphuric acid as it decomposes on heating, and attacks paper.

212 gr. Aluminum Iodide
in 636 gr. Carbon bisulphide
60 gr. Carbon tetrachloride
or 60 gr. Carbon bisulphide
weight to give
100 gr. Carbon tetra Iodide

Practice

$3CCl_4 + 2H_2O_2 = 3CO_2 + 2HCl_6$

Tuesday May 23d

~~Added this day~~

Mass 0.245

Tuesday May 23d

Experiment on Elemi Gum with Nordhausen sulphuric Acid

Test petroleum residue for sulphur.

10 gr. of Petroleum residue

Sulphur only in traces.

June 1st 02

Test of Brick 30 minutes in furnace at 500°F.

Pt crucible + ore = 22 gr. 3200

Pt crucible = 22, 3000

Ore = 1,02 gr.

Crucible + $BaSO_4$ = 22, 3030

Crucible = 22, 3000

$BaSO_4$ = 00,0030

~~0,0039~~

0.0011

,02910

~~,039 = 3.9~~

~~3.9 %~~

0.0039 S.

0,040

~~0,3901 %~~

~~0,03901~~ S.

June 2d

Test for Sulphur in Sludge Acid.

Pt + Acid = 33,8250
Pt Dish = 25,8850
Acid = 18,9400

31,7540
25,8850
Amount of residue after Ign. for 500 5,8690

June 2d

Analysis of Wax.

1,6650 gr. of Wax took 18,8 cc. of Soda solution to neutralize

or they contained

1,509972 gr. of Stearic acid

or 90.69 % Acid

or 1,51 9.30 Cerosine
or 90.70 Stearic.

Acid

at 500°F.

Loss 8 gr. W. 11 gr.

2d test for Sulphur.

Weight 11 gr.
after 1 h. at 700

$$\begin{array}{r} 29,6225 \\ 22,9000 \\ \hline 6,7225 \\ \text{Sch} \quad 1 \\ \hline 5,7225 \end{array}$$

0,29 %

30 pounds to the ton

0,0038 % S to the ton

1. The Novak incandescent Lamp. T.N.

Weight of the Lamp = 83,4560

Weight of the Lamp full of air = 23.654 grams

Weight of the Lamp full of water = 225.5874 grams

Cubic volume of globe, 201.8984 cc.

Weight of air in bulb (by calculation) .261 grams

Weight of bulb exhausted (by calculation) 23.428

Weight of gas in bulb (by difference) 0.028

28,0490
It crucible = 22,3100

CaOH + ay = 5,7390

24,0870
23,3100
0,7770

$\frac{777}{3,03} = \frac{x}{100}$

17700 (573
17119 30,89
0061100
4584
051100
51,57
0,03 0

Experiments on Lubricator
out of Rosin oil and slacked
Lime.
Lime to be slacked with hot
water and well washed to
get rid of stone substances
and silica, and only the
fine milky slacked lime
drawn off and used

The series of experiments resulted
in the following method:

A weighed quantity of
rosin oil is heated to boiling
and the lime gradually dropped
in as long as it dissolves
clear, the reaction is accompanied
by a bubbling up of the
mixture, and it gives off
steam.
On cooling the mixture
stiffened and gave a clear
and greasy substance
which pasta good

consistency from freezing point up to 95° F.

A portion of this clear grease was ignited and heated on a platinum crucible till the residue was perfectly white.

Crucible + grease = 26.00
Crucible = 22.30
grease = 3.70

Crucible + CaO = 23.645
Crucible = 22.300
CaO = 0.345

33.5 | 3.7
33.3 | 9.05 % CaO.
00200

Test to determine the quantity of CaO in the milky and wet slaked lime.

~~Quicklime~~ =
Lime + crucible = 27.2700
crucible = 22.3000
weight of wet lime = 4.9700

After igniting = 24.0400
Crucible = 22.3000
1.74

17400 | 4.97
1491 | 35.01
2490
2485 35.01 % CaO
00500 in the wet

Lime mixture

Experiments with
Rosin & Lima oil to combine
it with lime

I 20 gr. Lima oil
& 20 gr. Rosin
gave a sticky unsuitable
mixture

II 5 gr. Lima oil
10 gr. Rosin
gave an equally bad
result

III 10 gr. Lime oil
10 gr. Rosin
gave an equally bad
result.

Stir slacked lime with sufficient water to a rather thick milky fluid like thing, & sieve to remove stony substances, and allow to stand till the fine milky lime settles, let the water off.
To this white paste of milk of lime let the rosin oil flow, stir till the mass becomes thickly fluid water being separated.
Quantity of lime 20 to 25 per cent.

The resulting substance is a thick opaque yellowish butter which had stood quite a big vaccation in temperature without changing consistency

Experiments for determining quantity of Sludge Acid separated out of Petroleum (Crude) by Sulphuric Acid. — at 115°F.

I 40 gr. Penna petroleum —
5 gr. Sulphuric Acid
2.5 gr. Sludge Acid.

35 [i] 6.25 %

II 96. Penna petroleum
8 Sulphuric Acid
5 Sludge Acid

5.20 %.

III 60 Penna petroleum
8. Sulphuric Acid
4.50 Sludge Acid

7.50 %

40 gr. Lima Oil
5 gr. Sulphuric Acid
3.5 gr. Sludge Acid

8.58 %.

60 gr. Lima Oil
5 gr. Sulphuric Acid
7.50 gr. Sludge Acid

12.16 %

60 gr. Lima Oil
3 gr. Sulphuric Acid
5 gr. Sludge Acid

8.33 %

Lubricator experiments

I Sodium Sulphate does not [illegible] with [illegible] oil [illegible] agreeable [illegible] combine [illegible] heating.

The product is a yellowish brown transparent mass of soapy texture, [illegible] with water. If Potassium carbonate is used it is a lumpy mass in the bottle, this mass also being [illegible] on the water both apparently melts and forms a solution which however separates out the soap on cooling.

Does not seem good for lubricating purposes.

Sodium Sulphate

Does not seem to combine with resin oil. The sulphate dissolved in water separates out of the resin oil as soon as the water boils off.

Lubricator experiments

II Magnesium Carbonate does not seem to combine readily in either the dry or moist state with Rosin oil. In the first experiment crystalline Magnesium carbonate was used

III Magnesium Oxide obtained by ignition of the crystalline carbonate does not combine readily with rosin oil in the cold, and does not seem to combine in any quantity on heating.

Lime oxide does not seem to combine to any extent readily with resin oil even after prolonged boiling.

Ferrous sulphate & pot. by
[illegible] and Carbonate of
Soda $Fe(OH)_2 + Fe(OH)_6$

Combines on boiling to black but
gives a syrup which has very
poor lubricating qualities.

Chromium Metal & Carbonate
combine on boiling with resin
oil and form on cooling a
yellowish brown transparent
resin. The resinate however does
not seem to be easily made -
directly out of resin oil and
chromium oxide, this as a
lubricant is too sticky

Ferrous carbonate combines with
resin oil after boiling the
mixture for a long time till all
the water is driven off, the reaction
takes place only slowly, the product
is a yellowish hard vitreous mass
insoluble in an excess of resin
oil and also in turpentine
The product seems to be a sulphate
of iron which has lost its water
of crystallization

Carbonate of Iron seems to combine
easily with resin oil on boiling
but gives a thin iron lubricating
reddish mixture.

Calcium sulphide suspended in
water and added to boiling resin
oil does not seem to dissolve readily
but a reaction takes place as the
Calcium sulphide turns black and
forms a stiky suspended mass
in the oil.

Zinc carbonate

A solution of zinc carbonate in water added to fuming rosin oil deposits the zinc carbonate as a hard stony substance as soon as all the water has boiled off.

Ammonium sulfide

Ammonium sulfide first darkens rosin oil but soon is itself driven off all of leaving the rosin oil unchanged (apparently).

Sodium Silicate

No Good.

Aluminum hydroxide $Al(OH)_3$

Sulphur

Finely powdered sulphur melts and then dissolves very readily in rosin oil, but crystallizes out again on cooling forming a sort of emulsion yellowish emulsion in which sulphur with crystalline structure is suspended. Has no lubricating properties

Sulphur mixture and Sodium Oleo rosin oil soap.

Combine on heating to a clear yellowish brown to transparent syrup which coagulates to a transparent mass on cooling. The sulphur separates out after the cold mixture has been standing for an hour or so.

Dissolves on heating in rosin oil and forms a yellowish emulsion which has however no good lubricating properties.

Sludge Acid experiments for preparing lubricator

Sludge Acid & Rosin oil forms a too thick mass for lubricating purposes.

The Sludge Acid was dissolved in Rosin oil on the water bath and formed a dark brown syrup.

Sludge Acid and Tallow melted together form a dark brown mass which is too solid and sticky for lubricating purposes

Sludge Acid melted with tallow dissolved in petroleum separates out on the cooling of the mixture

Sludge Acid rosin and tallow form a fluid syrup which has a darkish brown colour and poor lubricating qualities

Sludge Acid } Sludge Acid
Rosin oil } Rosin oil
Tallow

Sludge Acid } Sludge Acid
Sperm Oil } Sperm Oil
Tallow

Sludge Acid } Sludge Acid
Cotton seed oil } Cotton seed oil
Tallow

Petroleum } Sludge Acid
Sludge Acid } Tallow
Tallow

Sludge Acid and Sperm oil mass too fluid and poor lubricating properties

Sludge Acid Sperm oil and tallow have poor lubricating qualities and very little body

Sludge Acid petroleum and Tallow with a large percentage of tallow give fairly good lubricating products but the amount of tallow has to be very large

Stearic Acid does not seem to
be a good addition to lubricants
as it diminishes the lubricating
qualities rapidly and although
it increases the [illegible] and
consistency the main effect seems
to make the mass sticky and
to make it gum.

Rosin oil Slacked Lime
& Tallow

This mixture does not have enough
body after a month for 24 hours
it is still very fluid and
for a lubricator fluidity is
[illegible]

Rosin oil Solway Soda Tallow

Does not give a good mixture

Determination of Platinum
in a platinum alloy.

Crucible + Pt	11,4355
Weight of crucible	11,424
	0,0115
Filter ash	= 0,0010
Weight of Pt	= 0,0105

Weight of wire = 0,1750.

6 % Platinum

Almond oil

[illegible] oil and [illegible]

[illegible] oil

Paraffin and [illegible] oil

Petroleum [illegible]

Lime slacked, Rosin oil, and Tallow.

in proportions of 30 gr. of Lime 34 Rosin oil and 5 gr. Tallow forms a yellowish white mass with good consistency and fairly good lubricating properties.

This mixture is very much like the Rosin oil and slacked lime mixture tried before.

Palm Oil Lubricants

(Heavy wagon Grease) 1.57 cents @ lb

Melt 31 parts of Palm Oil with 8.5 parts of tallow add a concentrated solution of 3.5 parts of Soda, then 92 parts of Water stir well and allow to congeal.

Consistency fair, lubricating fair

Yellowish white mass.

Grease for very heavy wagons

1. 1.25 cents @ lb. Winter
2. 1.50 cents @ lb. Summer

2) (Summer) is a slightly yellowish mass of good consistency and fair lubricating properties.

Proportions for 2.

Tallow 420 palm oil 490
soda 35 water 2300.

American palm oil lubricant

A Tallow 15. Palm oil 10. Soda 2.5
Water 16. 3.04 cents @ lb.
B Tallow 10. Palm oil 10 Soda 3.5
Water 30. 2.06 cents @ lb.

Both these lubricants are a yellowish substance of the appearance of butter after standing for a few hours they remained smooth and fair lubricating qualities.

A has more body than B is perhaps a little too thick and gritty.

A

Tallow	750	Tallow	380
Palm oil	380	Palm oil	125
Paraffine	200	Paraffine	65
Soda	50	Soda	25
Water	1300	Water	420
1.89 @ lb.	N.g.	2.54 @ lb.	N.g.

Tallow	280	
Palm oil	100	
Rosin oil	70	
Soda	20	N.g.
Water	500	
	2.10 @ lb.	

Tallow	10	1.36 @ lb.
Palm oil	10	
Rosin oil	20	
Soda	7	
Water	60	

This mixture does not combine to a mass of any consistency and is of no use as a lubricator as the parts are only suspended in the water and do not form a mixture of any ~~homogen~~ uniform composition

Tests for Albumen in Urine
with Potash of Solution

Mr Brown

Urine passed at 1.30 PM
Friday July 7th
Tested at 5 P.M. July 7th
Sugar none

Tested at 9 AM
Saturday July 8th
no ppt

Tested at 12.15 PM
Saturday July 8th
no ppt of Albumen
reddish Brown.

Harris

Urine passed at 3 P.M
Friday July 7th
Tested at 5 PM July 7th
Sugar none

Tested at 9 A M
Saturday July 8th
no ppt

Tested at 12 Noon
Saturday July 8th
no ppt

A. J. S.

Urine passed at 3 P.M
Thickly July 7th
Tested at 5 P.M
July 7th
Sugar none
at 9 A.M. Saturday
July 8th no print
12 Noon Sat.
July [illegible] pt

C. C. Edison

Urine passed at 6.45
P.M. Thickly July 7th
Tested 9 A.M. July 8th
blue solution clouded and
turned a milky green.

Tested at 12.15 P.M. Saturday
July 8th Short ppt fluid
turned a cloudy red

Edison

Urine passed 9 P.M.
Friday July 7th
Tested 9 AM Saturday
July 8th
no ppt

Tested at 12 Noon
Saturday July 8th
no ppt - filed Sunset
colour

Edison

Urine passed 10.20 AM
Saturday July 8th
Tested immediately no ppt
Tested 12 Noon Saturday
July 8th
~~no~~ ppt
Pelli g not yet discoloured

Ay J

Urine passed at 10.20
A.M. Saturday July 1st

Tested at 12 Noon
Saturday July 8th
Feeling not even disturbed

Harris

Urine passed 11.55
A.M. Saturday July 8th

1893
Feb

Tested at 12 Noon
Saturday July 8th
Feeling not even disturbed

Urinary Tests

Boil urine down to coagulate suspended matter, shake with animal charcoal, filter and then test for sugar with Fehling. Samples of urine should always be drawn from well mixed twenty four hours

Take 10 cc of urine in weighed Platinum dish and evaporate to dryness, and weigh to constant weight, determine the total quantity of solid matter

Ignite solid matter weigh, determine quantity of inorganic matter

Treat ash with nitric acid and water.

Silver nitrate precipitates the chloride

Barium chloride the sulphuric acid

Ammonium molybdate the phosphoric acid.

Urinary test.

Tuesday July 11th

NRS 1893

Mr Edison – Twenty four hours urine no sept with Fehling – Samples taken separately in small quantity gave a slight sugar reaction.

Test for Albumen negative

Wednesday July 12th

Urine tested with Fehling no sept (sugar) for albumen negative.

Tuesday July 11th

Heise Fehling solution

ppt (sugar)

Albumen test negative

Wednesday July 12th

Fehling Solution

ppt sugar

Albumen test negative

Thursday July 13th

Harris Urine fresh passed at 10 A.M.

tested immediately

with Fehling no ppt.

no albumen reaction

sp. g. 1019.

Urine passed at 1.15 PM.

sp. g. 1024

with Fehling no ppt

albumen reaction none

Thursday July 13

urine passed one night

Heise sp. g 1025.

no ppt with

Fehling Solution no albumen

reaction

Friday July 14th

sp. 1018 urine passed

over night no ppt with

Fehling no albumen reaction

Quantitative determination of Titanium in Chalcocite Ore

Pt dish + ore = 25,40[illegible]
Pt dish = [illegible]

Ore = [illegible]

Pt dish + ppt = 20,722
Pt dish = 20,519
0,203

Crucible + ppt = 22,143
Pt crucible = 22,124
00,019
filter ash 00,003
weight ppt = 0,0157

Harris = 0,195 % Ti
0,312 % TiO_2

Stewart = 0,192 % Ti
0,316 % TiO_2

Harris

Urine passed at 9 AM
Sp. g 1020.
No reaction with Bismuth and nitrate.

Mr Edison

July 19th Urine passed Morning.
Sp. g = 1026.
No sugar
Albumen none

Qualitative Analysis of non magnetic Shallow Ore

Examination for Sulphur — none

no Al, Fe, Ti, Bi, Cr, Cl, P, As, H, Pb, In, Sb, no albumen, Ni, Co, Zn, Cu, Cr, no Ba.

Acids. S. O. SO_4 no H_2SO_4 Ac (HCl) (Cu) (Mg)

no Al no Cr no albumen

Mr Edison

Urine passed July 20th evening

No albumen

No Sugar

Gravity 1024

Urine passed July 21st morning

No albumen

Traces of Sugar

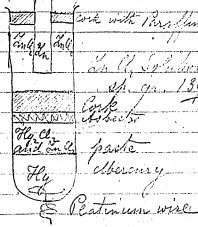
gravity 1028

Analysis of Concentrates and Tailings of Iron ore.

Concentrate 1#

Weight	Weight Fe_3O_4	Per Cent Fe_3O_4	Per cent Fe
50	38,50	73,13	52.94
Tails 1#			
50.	26,50	52,16	37.75
Concentrate 2#			
50	42	79.80	57.77
Tails 2#			
50	32	60.80	44.02

Preparation of Standard Cell for Mr. Kennelly



In C.P. bar amalgamated with H_2SO_4 and Zn

$ZnCl_2$ Solution prepared out of used $ZnCl_2$ ~~[illegible]~~

$ZnCl_2$ tested for impurities showed but a slight trace of iron

it was tested for Hg, Sb, Cd, Sn, Pb, Iron Aluminium Cl, H_2SO_4 and HNO_3

Sp. gr. of Solution at 15°C. 1,391.

Charge Pt wire 0,042 and $ZnCl_2$ to Desp. N°587 Mr Kennelly

Mr. Edison's

Urine passed Evening July 25th

Sugar: none
Albumen: none
Reaction: acid
Sp. g.: 1024

Urine passed Morning July 26th

Sugar: none
Albumen: none
Reaction: acid
Sp. g.: 1024

Fehling Solution

H { 96 gr. Rochelle Salts
188 gr. Water
33 gr. NaOH
100 gr. Water

B { 20 gr. $CuSO_4$
Water 288

A { 192 gr. Rochelle Salts
376 gr. Water
66 gr. NaOH
200 gr. Water

B 40 gr. $CuSO_4$
576 gr. Water

Bronzing Brass.

Bath No 1

Muriatic Acid = 3 lbs.
Nitric Acid = 1 lb.
Chloride of Iron = 1 lb
Arsenic = 1 ounce
When dissolved add water 1 lb.

Bath No 2.
Muriatic Acid 5 lbs
Nitric Acid 2 ounces
Powdered Cobalt 1 lb.

Try proportions of nitric acid in bath No 1. So that a perfectly even unspotted surface results.

Dip the object in bath No 1 then withdraw and dip in bath No 2 then wash with hot water

With arsenic in the above proportions color too light the ~~quantities~~ proportions use where the following

1 { 30 gr. Hydrochloric Acid
10 gr. Nitric "
10 gr. Iron Chloride
~~11~~ 1 gr. Arsenic
10 gr. Water

2 { 50 gr. Hydrochloric Acid
1,125 Nitric
10 gr. Iron Scale

Experiment given up to attend to bricking experiment

April 11th 1894

Agreed very dark color is obtained by dissolving 2 1/2 oz. white arsenic in HCl + dilute HNO3 + 1/2 oz. Ferri sesqui chlorid in H2 mixing + diluting to about 1 pint

Harris

Urine passed Morning
Urine pass by Mr Edison

Sugar (trace) (?)
Albumen (trace) (?)
Sp. gr. 10.28.
Reaction acid.

Urine passed July 31st
evening by Mr Edison
Sugar (trace)
Albumen (trace)
Sp. gr. 1030
Reaction acid

Urine passed by Mr Edison
August 1st evening.
Sugar trace
Albumen none
Sp. gr. 1028
Reaction acid

Sugar none
Albumen none
Reaction acid
Urine passed
Morning Aug 2d

Experiments on Sludge Acid
W

Dish + Sludge acid = 50,250
Weight of dish = 31,904
Sludge acid 18,346

One 1/2 hour in air bath at
600 F. gives

Residue + dish
Weight of dish
Residue

No result boiled over

Dish + Sludge Acid = 32,960
Weight of dish = 29,47
Sludge Acid = 3,490

Dish + residue = 30,752
29,47
1,282

12820 | 369
1047 | 36,73
0235 6 0
2094
0256 0
2443
1170

Residue 36,73 %.

Urine passed by Mr Edison
Morning 9.30 May 2d
1 pint
Sugar none
Albumen none
Sp. gr. 1018
Reaction acid

Experiments with a mixture of 30 parts Sludge Acid 10 parts Urina petroleum and 1 part oxydising agent

I. Chlorate of Potash
Dish 26. 80,5

3 gr. Mixture
1 gr. Chlorate of Potash

After ½ hour at 600° the mass was nearly totally carbonized forming a dark puffed up film

~~Weight of residue~~

80,5
83.
Weight of residue = 2,5 gr.
1,5.

250 | 9 or 27,7%
18 | 27,7
070
63
070

150 | 8
70 | 18,75
64
60
56

2 Salpeter Dish 27. 85,5

5 gr. Mixture
1/2 gr. Nitrate of Soda

After 1/2 hour at 600 the mass still smelt and looked like vinegar acid

Weight of residue 88
Weight of residue 85,5
2,5

or residue 45 5/11 %

2500 | 55
220 45.45
0300
275
1250
220
1000

5 200

5 Manganese dioxide Dish 28. 84

5,5 gr. Mixture
1/2 gr. Manganese dioxe
6 gr.

do.

88
84
Weight of residue 3. 92.

or 50 %

5, 2,5

2500 | 55
220 45.45
0300
275
1250

4) 1 part Nitrate and 1 part Carbonate of Soda

Dish 29 33

6 gr. Moisture
1½ gr. Carbonate
½ gr. Nitrate Soda

do. 88
83
Weight of residue 5 gr.

500 | 7
49 | 71.4
010
30

or 71.4 %

400 | 6
36 | 6,6,66

5) 1 part Chlorate and 1 part Carbonate of Soda

Dish 30. 86,5

5,5 gr. Moisture
½ gr. Carbonate
½ gr. Chlorate

do. 90,5
86.5
Weight of residue 4 gr.

5000 | 6.5
390 | 61.5
01100
65
350
325
0250

or 61,5 %

3000 | 55
275 | 54.54
250
220
300

P

Dish 31. Potassium Carbonate
weight 83 gr.

5 gr. Mixture
1 gr. Carbonate

Weight 86.
83
Residue 3 gr.

2 — 5

40 %

Dish 32 Sodium carbonate
weight 84 gr.

5,5 gr. Mixt
1 gr. Carbonate

Weight 87
84
Residue 3

2. — 5,5

2000 | 55
165 36,36
0350
330
0200

Dish 33 ~~Magnesium~~ Calcium Carbonate
weight 83 gr.

5 gr. Mixture
1 gr. Carbonate

85,5
83
2,5

1,5 — 5

30%

Dish 34 ~~Calcium Carbonate~~ Magnesium oxide
weight 82 gr.

5 gr. Mixture
1 gr. Oxide

84,5
82
2,5

1,5 — 5

30%

Dish 35 Calciumoxyde.
weight 84

5 gr. Moisture
1 gr. Oxide.

86,5
84
2,5

1,5 — 5.

150 | 5
30 %.

Dish 36. Moisture with ore to
weight 96 ascertain loss of weight
in bricking.

10 gr. Ore Moisture

95,5
86,
9,5

950 95 %

Experiments on Pricking Mixtures

26) 8 gr. Mixture 1 gr. Chlorate Potash
27) 5 gr. Mixture 1½ gr. Nitrate Soda
28) 5.5 gr. Mixture 1½ gr. Manganese Dioxide
29) 6 gr. Mixture ½ gr. Carb. ½ Chlorate
30) 5.5 gr. Mixture ½ gr. Carb. ½ Chlorate
31) 5 gr. Mixture 1 gr. Carbonate Potassium
32) 5.5 gr. Mixture 1 gr. Carbonate Soda
33) 5 gr. Mixture 1 gr. Carbonate Calcium
34) 5 gr. Mixture 1 gr. Mg Oxide
35) 5 gr. Mixture 1 gr. Calcium oxide
36) 10 gr. Mixture
A 235 Mixture of ore and Sulphuric Acid (as in pricking)

A1) Mixture of ore and sulphuric Acid mixture with 1 gr. Nitrate and 1 gr. Carbonate of Soda
1000 gr. Ore 18. Sulphuric Acid mixture
A2) 1 Carbonate 1 Nitrate of Soda
same mixture with 1 gr. Silicate of Soda
A3 same without Silicate of Soda
A ore alone
A4 ore with mixture A.
do.

	Weight of A.	Weight of Mixture	Weight of Pricker	% Paid
26	80.5	9 gr.	2.5	18.75
27	85.5	5.5 gr.	2.5	40
28	84	6 gr.	3 gr.	45.45
29	83	7 gr.	5 gr.	66.66
30	86.5	6.5 gr.	4 gr.	54.54
31	83	6 gr.	3 gr.	40 %
32	84	6.5	3	36.36
33	83	6.	2.5	30 %
34	82	6	2.5	30 %
35	84	6.	2.5	30 %
36	86.	10	9.5	95 %
A	—	235 gr.	232.	98.72 %
		loss of mixture	70.9 %	
A1	200	250.	Corrected 246 or 245.5	98.0
A2	229	251.	249	99.20
A3				
A4	200.5	250.5	249.5	
	200.5	250.5	248.5	99.00
	230	250.	247	

Experiments on Mixture.

	Weight of dish
Ore alone	250.5
Ore with 30 Sludge 10 Lima 1 gr. Carbonate 1 gr. Nitrate Soda to a 100 Ore	250.5
"	250.

Sludge acid mixture 10 gr. Nitric acid 1 gr.

dish (38) Weight of dish 80.50

Dish (39) Weight 82.5 H_2SO_4 1 gr. HNO_3 1 gr. Mixture 5

Dish (40) 81 of SO_4 2 gr. 6.5

Dish 41 83.50 HNO_3 1 gr. HCl 1 gr. Mixture 6.5

Dish 42 Lima oil and Sludge Acid weight 85. Mixture 6.5

Dish 43. weight 86 HNO_3 1 gr. Mixture 5

Dish 44 weight 88.5 Bleach. P. 2 gr. Mixture 5

Dish 45 weight 80.5 H_2O 1 gr. 5.5

Dish 46 83.5 $FeCl_3$ 1 gr. 5.5

Dish 47 80 Br 1 gr. 7

Dish 48 84 Cyanide 1 gr. 1.5

Dish 50 84 Iodine 1 gr. 7

8 Mn O_2 1 gr. 8.50

Bricking Mixture

Weight of Residue	Per cent loss	Percent loss orig. m
249.5	0.40%	
248.5	1.0%.	88.63%
246.5	1.6%	77.77%

Weight Mixture	Residue	Percent Res.	Percent Loss
11.50	upset		
7	85.50 2	40 %	60 %
2.50	84.50. 1.50	23.07 %	76.93
8.50	87 3.50	53.84 %	46.16
6.50	87.50	38.46 %	61.54 %
6	89.50	90.	30 %
7.	86.50	40. %	60
upset			
	86 1	20 %	80 %
	86.50 1.50	21.4 %	78.6 %
	83.50 .50	10 %	90 %

Tests on bicking mixture
Sludge acid and Lima petroleum
in proportion of 30 to 10.
Tried filter effects of different cheap
ch. organic salts (results negative)
Then tried effect of strong anorganic
acids. —

Urine passed by Mr Johnson Date	Sugar	Albumen	Sp. Gr.	Reaction
Evening July 25	None	None	1024	acid
Morning July 26	None	None	1024	acid
Evening July 31	Trace	Trace	1030	acid
Morning Aug 1	Trace	Trace	1028	acid
Evening Aug 1	Trace	none	1028	acid
Morning Aug 2	None	None	1018	acid
Evening Aug 2	Trace	Trace	1028	acid
Morning Aug 3	Trace	none	1027	acid

Dish	Weight	Compound	Moisture	Dish with Residue	Residue	Parents	Per loss
51	84	Zinc SO_4 2g.	5.5	86	4	72.72	27.28
52	78	Tellurous 2g	7	82.5	2.5	35.71	64.29
53	84	Acetate 3g.	18.	upset			
54	84	Chloride 1g.	5.5	87.5	2.5	45.45	54.55
55	83.5	Nitrate 2g.	7	88.5	3.5	50	50
56	84	Arsenate 2g	15.5	88.5	2.5	45.45	54.55
57	81.50	H_2O_2 1g	5	83.	1.5	30	70
58	83	Abs boracic 1g	6	87	3	50.	50
59	82	Alkg SO_4 1g	7.5	87	4	53.33	46.67
60	80.5	Abs CO_3 2g	15	85	1.5	30	70
61	85	Abs NO_3 2g	6	upset			
62	86	Myrantate 2g	6	90.5	2.5	41.66	58.34

Effect of ~~Sludge~~
Sulphuric & Lima

Weight of beaker 95 gr.

150 gr. of Lima treated with
10 gr. Sulphuric gave 21,5
Sludge acid or 14,33 %

added 10 gr. more Sulphuric

105,5
75
130,5

and left 30,5 Sludge
acid
or 20,33 %
after standing for 5 days
or 21 %

106,5
75
131,5

Try 200 Sludge
150 Lima
82,5 Nitrate of Soda
38,5 H_2SO_4

100 gr. Sludge
70 Lima
10 H_2SO_4
6 $NaNO_3$
} would not brick

100 gr. Sludge
90 Lima
10 H_2SO_4
6 $NaNO_3$
} would not brick

100 gr. Sludge
81 Lima
10 H_2SO_4
6 $NaNO_3$
} wont brick

21 Sludge
10 Lime
1 H_2SO_4
1 Na NO_3
} wont brick

24 Sludge
8 Lime
Sulphur 20
} 250 gr. Ore
3.80 mixture
bricks fairly well
hardens well in the furnace
makes a very hard brick
~~would cost 9.92 cents~~

24 Sludge
8 Lime
32
32 gr. to 224.
wont brick

20 Sludge to 200 Ore
1 Sulphur
} wont brick

24 Sludge
8 Lime
10 Sulphur
} bricks fairly well
hardens in the furnace
very well
~~would cost 8.92 cents~~

N

24 Sludge
8 Lime
1 Sulfur
} bricks fairly well
hardens in furnace
well
would cost 8.92

Brick mixed in the ordinary proportion
weight of O = 195.5
after ½ hour at 600 weight = 115,
loss in weight = 1,5
~~Brick with proportion N of S~~
~~weight 3.1475~~ Loss 47.6%
weight of N = 177
after ½ hour at 600 weight = 175,5
loss in weight = 1,5
Loss 57.7%

21 Sludge
7 Lime
12 Rosin
} bricks fairly well
hardens in furnace very well
weight before heating = 184,50
weight after = 183,50
loss in weight = 1gr.
loss 40.4%

would cost 7.93

R
I

R_{II}

21 Sludge
7 Lime
1 Rosin
} bricks fairly wet hardens well in furnace

weight of brick before = 173.50
and after heating = 172.
loss 1.50

would cost 7.43

R_{III} loss 67 % Residue 33

18 Sludge
6 Lime
2 Rosin
} bricks moderately well only hardens very well

weight of brick before 175.50
and after heating 174.50
1.00

loss 45.8 Residue 55.20

would cost 6.94

18 Sludge
6 Lime
1 H_2SO_4
1 Chromate
} wont brick

18 Sludge
6 Lime
24 Asphalt
} too stiff wont mix

18 Sludge
6 Lime
10 Coal tar pitch
} dont mix well wont do

H_2SO_4 and Sawdust } not sticky wont do

HNO_3 and Sawdust } no good

18 Sludge
6 Lime
5 Silphuric
} wont brick

R 4
27 Sludge
19 Lime
5 Silphuric
} bricks fairly well hardens well on heating

weight 175.5 - 174.5 | 31.15 %
est 113.91 | 68.85 %

R 5 — 24 Sludge, 8 Lime, 5 H_2SO_4 — bricks fairly hardens well in furnace

cost (13.42)

weight 182.50 — 181.

Loss 33.22 Residue 66.78 %

R 6 — 21 Sludge, 7 Lime, 5 H_2SO_4 — bricks moderately well hardens well in furnace

cost (11.93)

weight 172.50 171.50

39.37 loss 60.63 Residue

R 7 — 24 Sludge, 8 Lime, 2.50 H_2SO_4 — bricks moderately well hardens well

weight 180.50 179

46.10 Residue

R 8 — 21 Sludge, 7 Lime, 2.5 H_2SO_4

O — 30 Sludge, 10 Lime — 13.20 cents Residue 52.8

N — 24 Sludge, 8 Lime, 1 Sulphur — 10.56 cents Residue 42.3

R 1 — 21 Sludge, 7 Lime, 2 Rosin — 10.24 cents Residue 9.6

R 2 — 21 Sludge, 7 Lime, 1 Rosin — 9.74 cents Residue 33

R 3 — 18 Sludge, 6 Lime, 3 Rosin — 8.92 cents Residue 55.2

R 4 — 27 Sludge, 9 Lime, 5 Sulphuric — 15.68 Residue 68.85

R 5 — 24 Sludge, 8 Lime, 5 Sulphuric — 14.36 Residue 66.78

R 6] 21 Sludge
7 Lime } 12.64 cents Res. 6.1
5 Sulphuric

R 7] 24 Sludge
8 Lime } 12.46 cents Res. 46.1
2,5 Sulphuric

R 8] 21 Sludge
7 Lime } 11.74 cts Residue
2,5 Sulphuric

R 9] 21 Sludge
7 Lime } Residue
8 Resin } 10.82 cts 60.32
2,5 Sulphuric
weight 174 – 173

R 10] 21 Sludge
4 Lime } wont brick

R 11] 21 Sludge } bricks poorly
3 Lime } hardens fairly well
weight 170,5 – 170 } cost 7.68 (No good)
Residue 72.38

R 10] 25 Sludge } mixes well, bricks well
5 Lime } hardens well.
178.50 – 178 } 9.70 cents Residue 79.08

R 11] 20 Sludge } mixes well bricks fairly
4 Lime } well hardens poorly
172.50 – 172 } 7.76 cents Residue 62.9
No good too brittle

R 12] 24 Sludge } mixes and bricks
4 Lime } fairly well hardens poorly
173.50 – 173 } 9 cents Residue 74.23
No good too brittle

R 11] 20 Sludge } mixes and bricks well
5 Lime } hardens well
176 – 174 } 8.1 cents Residue 48.8

R 12] 20 Sludge } mixes and bricks
5 Lime } well hardens
1 H_2SO_4 } 8.91 cents Residue 53.1
183.75 – 182.75

R 13] 20 Sludge } mixes and bricks
5 Lime } well hardens well
1 Sulfur } 9.22 cents Res. 62.
170.5 – 169.75

R 14]

18 Sludge } mixes and bricks well
5 Lime } hardens well
2 Rosin } 8.53 cents Residue 68.3

169.5 – 168.75

R 15

15 Sludge } mixes fairly well
5 Lime } bricks do. hardens well
Rosin } 8.03 cents
no good

182.5

R 16

20 Sludge } bricks moderately
5 Lime } hardens poorly
1 Rosin } 9.72 cents
1 Sulfur } no good
Residue 67.93

172.50 } 172.25

R 17

18 Sludge } bricks fairly well hardens
9 Lime } 9.82 cents
9 Slaked Lime } hardens well
to brittle no good

185.50. 185

R.

14 Sludge } wont brick
7 Lime
7 Lime

16 Sludge } bricks moderately well only hardens badly
8 Lime } no good
8 Lime } 7.48 cents residue

169.25 – 168

R 18

24 Sludge } mixes and bricks well, hardens well
8 Lime } badly no good
4 Lime } 10.76 cents Residue 61.54

182.50. 181.50

R 19

21 Sludge } mixes and bricks well
8 Lime } 9.40 cents Residue
13.5 Lime } hardens poorly
no good

135.15. 134.25

R 20

18 Sludge } mixes and bricks
4 Lime } no derability only
2 Lime } 7.14 cents
no good too brittle

135 – 134.2

15 Sludge } mixes and bricks
6 Lime } poorly
2 Lime } 7.09 cents
too brittle no good

mixes and bricks fully

15 Sludge
5 Lime } 11.6 cents
5 Molasses } too brittle no good

133,2

Molasses 5 } mixes and bricks well
Sludge 20 } 10.65 cents
Lime 5 } Residue 54.3%

139,2. 138.35 too brittle no good

R.15 Molasses 4 } mixes and bricks well
Sludge 16 } 8.52 cents
Lime 4 } hardens well
Residue 36.9%

146. 145

Molasses 3 }
Sludge 12 } 6.39 cents
Lime 3 } no good won't brick

18 Sludge
6 Lime } 10 cents
4 Molasses } no good won't bricks

18 Sludge
6 Lime
4 Molasses } won't mix the
10 Soda } aqueous soda
10 Water } solution dont
combine with the Sludge and lime

18 Sludge
6 Lime } the Soda put
10 Soda } in dry dont
combine with the Sludge and Lime

Anorganic Salts do not seem to combine with Sludge acid in the absence of water at ordinary temperatures nor on heating on the steam bath.

21 Sludge
Lime } won't brick
2 Nitric acid

Hydrochloric
and Sludge dont combine
at ordinary temperatures or on
the steam bath

20 Sludge
4 Lima } 9.76 cents
2 Tar
no good wont brick

10 Sludge
6 Tar } no good
4 Lima } wont brick

21 Sludge
5 Limer } 9.46
1 Tar } no good
wont brick

21 Sludge
7 Lime } 11.24 cents
12 Tar } no good
wont brick

None of the experiments with mixtures of Tar Sludge and Lima were successful.

Equal quantities of Sodiumsulphide and Sludge acid wont mix.

Sludge acid does not combine to a uniform mass with Caustic Soda in aqueous solution.

Sludge acid does not combine to a uniform mass with carbonate of Soda in aqueous solution.

Lima Sludge acid and ~~petroleum~~ nitric acid react quite energetically but do not form a suitable mass with good sticking properties for bricking.

R.16 24 Sludge
8 Lime
1 Potassium permanganate
1 water

184 132.7 Residue 61 0.3%
bricks well and hardens well

R17

21 Sludge
7 Lime
1 Permanganate
1 Water
} mixes and brick fairly well
hardens well

146.1 145.1
Residue 46.15 %

24 Sludge
8 Lime
1 Chromic Acid
1 Water
} mixes and bricks fairly well

no good too brittle

139.4 138.3
39 % Residue

21 Sludge
7 Lime
1 Chromic Acid
1 Water
no good wont brick

27 Sludge
9 Lime
1 Rosin
1 Sulphur
} 13.45 cents
wont brick

24 Sludge
8 Lime
1 Rosin
1 Sulphur
} 12.53
wont brick

21 Sludge
7 Lime
1 Rosin
1 Sulphur
} 10.81
wont brick

18 Sludge
6 Lime
1 Rosin
1 Sulphur
} 9.42 cents
wont brick

R 19

27 Sludge
7 Lime
1 Rosin
1 Sulphur
} 12.67 cents.

133.3 132.1 56.0 %
mixes and bricks fairly well
hardens well

1

18 Sludge
6 Lima
0,6 Rosin } 8.44
0,6 Sulphur
Resid. 47.29 %

132,8 ~~132~~ 132,1
mixes and bricks fairly well
hardens too brittle No good

R. 20

28 Sludge
6 Lima
2 Rosin } 13.09
1 Sulphur
Residue 47,69 %

127,8 126,3
mixes and bricks well hardens well

18 Sludge
4 Lima
1.50 Rosin } 8.53
0,60 Sulphur
Residue 41 %

129,7 mixes and bricks fairly well
128,9 hardens poorly too brittle
no good

Ferrocyanide of Iron in ammonia solution concentrated does contain with the Lime acid and Lima mixture

R. 21

28 Sludge
4 Lima
1 Molasses } 12.31 cents.
1 Sulphur
Residue 53,7 %

130,3 129,6
mixes poorly bricks very well
hardens well

21 Sludge
3 Lima
0.75 Molasses } 9.24
0,75 Sulphur

129,6-128,7
mixes poorly bricks fairly well
hardens poorly
no good

28 Sludge
4 Lima
1 Molasses } 11.74 cents
1 Rosin

Residue 42.5

124.3 123.5

mixes well binds fairly well
hardens poorly no good

21 Sludge
3 Lima
0.75 Molasses } no good
0.75 Rosin } worst brick

Regular proportions of mixture

Sludge Acid 30.
Lima pots. 10.

Residue 36,73 %

Regular proportions
Oil from separated Acid
3 and Sludge Acid.

before 4,6.
after
Residue 3,9 37 %

Separate acid 2#
and sludge acid.

120.5
46
4.0

before 9.
after 4.
Residue 5 55,5 %

Blue oil
and sluge

before 9.
after 3,5
Residue 4,5 50 %

These bricks are all fairly hard, but none so good as the standard mixture of 30 sludge + 10 lima (Harris)